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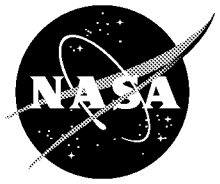

Technical Report Series on the Boreal Ecosystem-Atmosphere Study (BOREAS)

Forrest G. Hall, Editor

Volume 116

Agriculture Canada Central Saskatchewan Vector Soils Data

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Agriculture Canada Central Saskatchewan Vector Soils Data

David Knapp, Harold Rostad

Summary

This data set consists of GIS layers that describe the soils of the BOREAS SSA. These original data layers were submitted as vector data in ARC/INFO EXPORT format. These data also include the soil name and soil layer files, which provide additional information about the soils. There are three sets of attributes that include information on the primary, secondary, and tertiary soil type within each polygon. Thus, there is a total of nine main attributes in this data set.

Based on agreements made with Agriculture Canada, these data are available only to individuals and groups that have an official relationship with the BOREAS project. These data are not included on the BOREAS CD-ROM set. A raster version of this data set titled 'BOREAS Soils Data over the SSA in Raster Format and AEAC Projection' is publicly available and is included on the BOREAS CD-ROM set. See Section 15 for current details on data availability.

Table of Contents

1. Data Set Overview

1.1 Data Set Identification

Agriculture Canada Central Saskatchewan Vector Soils Data

1.2 Data Set Introduction

This data set consists of Geographic Information System (GIS) layers that describe the soils of an area that covers a swath through central Saskatchewan and a small area in Manitoba. The original data were submitted as vector layers in ARC/INFO EXPORT format.

1.3 Objective/Purpose

The objective of these data is to provide BOReal Ecosystem-Atmosphere Study (BOREAS) investigators with a map of soil types and other soil properties. Because the original data were not collected by BOREAS staff, it cannot be said what the original objective was for collecting them. Although these data were received from Agriculture Canada, they do not cover agricultural areas of the BOREAS Southern Study Area (SSA), only forested areas.

1.4 Summary of Parameters

The parameters include:

SOIL CODE, MODIFIERS, EXTENT, and soil names for primary, secondary, and tertiary soil units.

1.5 Discussion

This data set consists of GIS layers that describe the soils of the BOREAS SSA. These original data layers were submitted as vector data in ARC/INFO EXPORT format. These data also include the soil name and soil layer files, which provide additional information about the soils. There are three sets of attributes that include information on the primary, secondary, and tertiary soil type within each polygon. Thus, there is a total of nine main attributes in this data set. See Section 7.3 for more details.

1.6 Related Data Sets

BOREAS Soils Data over the SSA in Raster Format and AEAC Projection
CanSIS Regional Soils Data in Vector Format
BOREAS Regional Soils Data in Raster Format and AEAC Projection

2. Investigator(s)

2.1 Investigator(s) Name and Title

BOREAS Staff Science

2.2 Title of Investigation

BOREAS Staff Science GIS Data Collection Program

2.3 Contact Information

Contact 1:

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(306) 975-6305
rostad@digger.usask.ca

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Greenbelt, MD 20771
(301) 286-1424
(301) 286-0239 (fax)
David.Knapp@gsfc.nasa.gov

3. Theory of Measurements

Unknown.

4. Equipment

4.1 Sensor/Instrument Description
Unknown.

4.1.1 Collection Environment
Unknown.

4.1.2 Source/Platform
Unknown.

4.1.3 Source/Platform Mission Objectives
Unknown.

4.1.4 Key Variables
Unknown.

4.1.5 Principles of Operation
Unknown.

4.1.6 Sensor/Instrument Measurement Geometry
Unknown.

4.1.7 Manufacturer of Sensor/Instrument
Unknown.

4.2 Calibration

4.2.1 Specifications
Unknown.

4.2.1.1 Tolerance
Unknown.

4.2.2 Frequency of Calibration
Unknown.

4.2.3 Other Calibration Information
Unknown.

5. Data Acquisition Methods

These data were acquired in ARC/INFO EXPORT format as vector coverages. The Soil Names files and Soil Layer files are standard INFO files (also in EXPORT format) that provide soil attributes for the provinces of Saskatchewan and Manitoba. The soil code for each polygon can be linked to the corresponding soil code attribute in the Soil Names file. The Soil Layer file contains information about the various soil layers that exist for each soil name.

6. Observations

6.1 Data Notes

None.

6.2 Field Notes

None.

7. Data Description

7.1 Spatial Characteristics

7.1.1 Spatial Coverage

These data cover a swath running east-west through the central part of Saskatchewan. These coverages are in the Universal Transverse Mercator (UTM) projection using the North American Datum of 1927 (NAD27) in UTM zones 12, 13, and 14. The *.pp files give some information about the bounding latitude/longitudes of each coverage. Some information about the projection of each coverage may also be given. Sometimes this projection name may not be very descriptive (e.g., TABLE). In these cases, the user must determine in which zone the coverage might exist. This can be done by plotting the data with coverages of a known UTM zone. The approximate locations of the corners of this area are:

Corner	Longitude	Latitude
Northwest	110.4511W	55.0614N
Northeast	99.8739W	55.0614N
Southeast	99.8739W	52.8618N
Southwest	110.4511W	52.8618N

7.1.2 Spatial Coverage Map

Not available.

7.1.3 Spatial Resolution

These vector data are based on soils maps that were created at a scale of 1:125,000.

7.1.4 Projection

These data are in the UTM projection. The various coverages are in one of three different UTM zones (12, 13, or 14). Some of the coverages on the western end of this area are in UTM zone 12, most of the coverages in the center are in UTM zone 13, and those on the east end of the area are in UTM zone 14. These UTM projections are based on NAD27.

7.1.5 Grid Description

Not applicable.

7.2 Temporal Characteristics

7.2.1 Temporal Coverage

The time at which these soils were mapped could not be determined. They may have originally been mapped in the early 1980s, but the data have been updated and edited by Agriculture Canada based on new information since that time.

7.2.2 Temporal Coverage Map
Not available.

7.2.3 Temporal Resolution
Unknown.

7.3 Data Characteristics
See table of parameter names and descriptions following Section 7.3.3.

7.3.1 Parameter/Variable
SOIL CODE 1
SOIL CODE 2
SOIL CODE 3
MODIFIER SOIL 1
MODIFIER SOIL 2
MODIFIER SOIL 3
EXTENT OF SOIL 1
EXTENT OF SOIL 2
EXTENT OF SOIL 3

7.3.2 Variable Description/Definition

SOIL_CODE1	3-character code for the primary soil name. In this layer, the numerical value of each pixel corresponds to the SOIL_NUM attribute in the soil name and soil layer files. There is a unique SOIL_NUM for each SOIL_CODE.
SOIL_CODE2	3-character code for the secondary soil name. This layer is coded and can be used in the same way as the SOIL_CODE1 layer.
SOIL_CODE3	3-character code for the tertiary soil name. This layer is coded and can be used in the same way as the SOIL_CODE1 layer.
MODIFIER1	3-character code to show soil variations of the primary soil. The modifier applies to the soil name and the soil code. The numerical value of each pixel in this layer corresponds to the MOD_NUM attribute in the soil name and soil layer files. There is a unique MOD_NUM for each MODIFIER. Together with the SOIL_NUM, a unique record can be identified in the soil name and soil layer file that matches both the SOIL_NUM and MOD_NUM of the pixel.
MODIFIER2	3-character code to show soil variations. The modifier applies to the soil name and the soil code.
MODIFIER3	3-character code to show soil variations. The modifier applies to the soil name and the soil code.
EXTENT1	Percent of the map occupied by a specific soil. The numeric value of each pixel represents the percentage. Range = 34 to 100
EXTENT2	Percent of the map occupied by a specific soil. The numeric value of each pixel represents the percentage. Range = 0 to 50
EXTENT3	Percent of the map occupied by a specific soil. The numeric value of each pixel represents the percentage. Range = 0 to 33

The three SOIL_CODE and three MODIFIER attributes are associated with soil names. As explained above, they can be linked to the soil name and soil modifier values in the soil name and soil layer files. The items in the Saskatchewan soil names file include:

```
UNKNOWN     An unknown and undocumented attribute
PROVINCE    Province name (here they will all be SK for Sask. or MB for Manitoba)
SOILNAME    Name of soil
SOIL_CODE   A 3-character code identifying a soil
MODIFIER    Soil type modifier
LU          Land use
KIND        Kind of soil
WATERTBL    Water table characteristics
ROOTRESTRI  Soil layer that restricts root growth
RESTR_TYPE  Type of root restricting layer
DRAINAGE    Soil drainage class
MDEP1       Mode of deposition for primary soil
MDEP2       Mode of deposition for secondary soil
MDEP3       Mode of deposition for tertiary soil
ORDER       Soil order
S_GROUP     Soil subgroup
G_GROUP     Great group
PROFILE     Header from Detail II file
DATE        Date of last revision
A-THICK     A horizon thickness
SOL-THICK   Soil thickness
SOL-CHEM    Soil chemistry
PM-MODIFY   Parent material modification
PM-COMPLEX  Parent material complex
PMDEP2      Mode of deposition of second parent material deposition
            where a soil name is a complex of materials
PM-CHEM     Parent material chemistry
PMTEXCLASS  Parent material textural class
TEXMODIFY   Texture modification
FAMPARTSIZ  Soil family particle size
PHYSIOG     Physiography
```

The column names in the Manitoba soil names file are very similar, but some of the column names appear to be duplicated. The reason for this is unknown. The soil layer file is also included with these data. The information in the soil names file can be linked to the soil layer file. The soil layer file provides information about the soil strata for a particular soil name. The attributes in the soil layer file include:

```
PROVINCE    Province name (here they will all be SK for Sask. or MB for Manitoba)
SOIL_CODE   A 3-character code identifying a soil
MODIFIER    Soil type modifier
LU          Land Use
LAYER_NO    Horizon number
HZN_LIT     Horizon lithological discontinuity
HZN_MAS     Master horizon (upper case)
HZN_SUF     Master suffix (lower case)
HZN_MOD     Horizon modifier
UDEPTH      Upper horizon depth (cm)
LDEPTH      Lower horizon depth (cm)
COFRAG      Coarse fragments  (% by volume)
DOMSAND     Dominant sand fraction
VFSAND      Very fine sand (% by weight)
TSAND       Total sand  (% by weight)
TSILT       Total silt (% by weight)
```

TCLAY	Total clay (% by weight)
ORGCARB	Organic carbon (% by weight)
PHCA	pH in calcium chloride
PH2	pH as specified in project report
BASES	Base saturation
CEC	Cation exchange capacity (meq/100 g)
KSAT	Saturated hydraulic conductivity (cm/h)
KP0	Water retention at 0 kilopascals
KP10	Water retention at 10 kilopascals
KP33	Water retention at 33 kilopascals
KP1500	Water retention at 1500 kilopascals

(Water retention units are % by volume corrected for coarse fragment content.)

BD	Bulk density (g/cm^3)
EC	Electrical conductivity (dS/m)
$CACO_3$	Calcium carbonate equivalent (%)
VONPOST	Von Post estimate of decomposition
WOOD	Volume (%) of woody material
DATE	Date of last revision

7.3.3 Unit of Measurement

SOIL_CODE1 - None
SOIL_CODE2 - None
SOIL_CODE3 - None
MODIFIER1 - None
MODIFIER2 - None
MODIFIER3 - None
EXTENT1 - Percent
EXTENT2 - Percent
EXTENT3 - Percent

7.3.4 Data Source

These data were acquired in ARC/INFO format from:

Dr. Harold P.W. Rostad, Unit Head
Agriculture Canada-Research-CLBRR/LRD
Saskatchewan Land Resource Unit
Room 5C26 Agriculture Building
c/o The Soil Science Department
University of Saskatchewan Campus
Saskatoon, SK Canada S7N 0W0

7.3.5 Data Range

See Section 7.3.2.

7.4 Sample Data Record

Not applicable.

8. Data Organization

8.1 Data Granularity

The smallest unit of data for this data set is the entire data set on tape.

8.2 Data Format(s)

8.2.1 Uncompressed Data Files

This data set is stored in a single tar file. The files with an *.e00 extension are ARC/INFO EXPORT files. The mb* files are for Manitoba, while the sk* files are for Saskatchewan. The *.pp files contain latitude/longitude bounds of the coverage as well as other information. The *.doc files provide background information about the production of the map and source materials that were used. The files contained within the one tar file are:

```
mbd246s.doc
mbd246s.e00
mbd246s.pp
skd019s.doc
skd019s.e00
skd019s.pp
skd020s.doc
skd020s.e00
skd020s.pp
skd053s.doc
skd053s.e00
skd053s.pp
skd054s.doc
skd054s.e00
skd054s.pp
skd055s.doc
skd055s.e00
skd055s.pp
skd056s.doc
skd056s.e00
skd056s.pp
skd057.doc
skd057.pp
skd057s.e00
skd058.doc
skd058.pp
skd058s.e00
skd059.doc
skd059.pp
skd059s.e00
skd060.doc
skd060.pp
skd060s.e00
skd061s.doc
skd061s.e00
skd061s.pp
skd113s.doc
skd113s.e00
skd113s.pp
skd114s.doc
```

```
skd114s.e00
skd114s.pp
skd115s.doc
skd115s.e00
skd115s.pp
skd144.doc
skd144.pp
skd144s.e00
skd145.doc
skd145.pp
skd145s.e00
skd146.doc
skd146.pp
skd146s.e00
skd147.doc
skd147.pp
skd147s.e00
skd148s.doc
skd148s.e00
skd148s.pp
skd182s.doc
skd182s.e00
skd182s.pp
sksnf.e00       Saskatchewan Soil Names File
skslf.e00       Saskatchewan Soil Layer File
mbsnf.e00       Manitoba Soil Names File
mbslf.e00       Manitoba Soil Layer File
```

The following information, which is needed to decode the Soil Names file, was extracted (with modifications) from an information sheet supplied by the Canadian Soil Information System (CanSIS):

```
Column Name              Coded Values
-----------------       -------------
LU      Land Use
                          N    Native Conditions
                          A    Agriculture

KIND   Kind of Soil
                          M    Mineral
                          O    Organic
                          N    Nonsoil
                          U    Unclassified

WATERTBL   Water table characteristics
                          NO   Not present any time
                          YU   Present during unspecified time
                          YG   Present during the growing season
                          YN   Present during nongrowing season
                          YB   Present during both seasons

ROOTRESTR   Soil Layer that restricts root growth
                          --   Not applicable
                          0    Not present
                          1-9  Restricting layer number
```

RESTR_TYPE Type of Root Restricting Layer

--	Not applicable
UN	Undifferentiated
BN	Solonetzic B
SA	EC>4dS/m
CT	Compact (Basal) Till
OR	Ortstein
FP	Fragipan
LI	Lithic
CR	Cryic
DU	Duric
PL	Placic

DRAINAGE Soil Drainage Class

--	Not applicable
VR	Very Rapidly
R	Rapidly
W	Well
MW	Moderately Well
I	Imperfectly
P	Poorly
VP	Very Poorly

MDEP1 Mode of Deposition for primary soil
MDEP2 Mode of Deposition for secondary soil
MDEP3 Mode of Deposition for tertiary soil

--	Not Applicable
ANTH	Anthropogenic
COLL	Colluvial
EOLI	Eolian
FLEO	Fluvioeolian
FLLC	Fluviolacustrine
FLUV	Fluvial
FNPT	Fen Peat
FOPT	Forest Peat
GLFL	Glaciofluvial
GLLC	Glaciolacustrine
GLMA	Glaciomarine
LACU	Lacustrine
LATL	Lacustro-Till
MARI	Marine
RESD	Residual
SAPR	Saprolite
SEPT	Sedimentary Peat
SPPT	Sphagnum Moss
TILL	Till (Morainal)
UNDM	Undifferentiated mineral
UNDO	Undifferentiated organic
VOLC	Volcanic

ORDER Soil Order

--	Not Applicable

BR	Brunisolic
CH	Chernozemic
CY	Cryosolic
GL	Gleysolic
LU	Luvisolic
OR	Organic
PZ	Podzolic
RG	Regosolic
SZ	Solonetzic

Soil Subgroup and Great Group. Characters before the dot (.) go into the S_GROUP (soil subgroup) field. Characters after the dot go into the G_GROUP (soil great group) field.

-.-	Not Applicable
O.MB	Orthic Melanic Brunisolic
E.MB	Eluviated Melanic Brunisol
GL.MB	Gleyed Melanic Brunisol
GLE.MB	Gleyed Eluviated Melanic Brunisol
O.EB	Orthic Eutric Brunisol
E.EB	Eluviated Eutric Brunisol
GL.EB	Gleyed Eutric Brunisol
GLE.EB	Gleyed Eluviated Eutric Brunisol
O.SB	Orthic Sombric Brunisol
E.SB	Eluviated Sombric Brunisol
DU.SB	Duric Sombric Brunisol
GL.SB	Gleyed Sombric Brunisol
GLE.SB	Gleyed Eluviated Sombric Brunisol
O.DYB	Orthic Dystric Brunisol
E.DYB	Eluviated Dystric Brunisol
DU.DYB	Duric Dystric Brunisol
GL.DYB	Gleyed Dystric Brunisol
GLE.DYB	Gleyed Eluviated Dystric Brunisol
O.B	Orthic Brown
R.B	Rego Brown
CA.B	Calcareous Brown
E.B	Eluviated Brown
SZ.B	Solonetzic Brown
GL.B	Gleyed Brown
GLR.B	Gleyed Rego Brown
GLCA.B	Gleyed Calcareous Brown
GLE.B	Gleyed Eluviated Brown
GLSZ.B	Gleyed Solonetzic Brown
O.DB	Orthic Dark Brown
R.DB	Rego Dark Brown
CA.DB	Calcareous Dark Brown
E.DB	Eluviated Dark Brown
SZ.DB	Solonetzic Dark Brown
GL.DB	Gleyed Dark Brown
GLR.DB	Gleyed Rego Dark Brown
GLCA.DB	Gleyed Calcareous Dark Brown
GLE.DB	Gleyed Eluviated Dark Brown
GLSZ.DB	Gleyed Solonetzic Dark Brown
O.BL	Orthic Black
R.BL	Rego Black

CA.BL	Calcareous Black
E.BL	Eluviated Black
SZ.BL	Solonetzic Black
GL.BL	Gleyed Black
GLR.BL	Gleyed Rego Black
GLCA.BL	Gleyed Calcareous Black
GLE.BL	Gleyed Eluviated Black
GLSZ.BL	Gleyed Solonetzic Black
O.DG	Orthic Dark Gray
R.DG	Rego Dark Gray
CA.DG	Calcareous Dark
SZ.DG	Solonetzic Dark Gray
GL.DG	Gleyed Dark Gray
GLR.DG	Gleyed Rego Dark Gray
GLCA.DG	Gleyed Calcareous Dark Gray
GLSZ.DG	Gleyed Solonetzic Dark Gray
O.TC	Orthic Turbic Cryosol
BR.TC	Brunisolic Turbic Cryosol
R.TC	Rego Turbic Cryosol
GL.TC	Gleysolic Turbic Cryosol
O.SC	Orthic Static Cryosol
BR.SC	Brunisolic Static Cryosol
R.SC	Regosolic Static Cryosol
GL.SC	Gleysolic Static Cryosol
FI.OC	Fibric Organic Cryosol
ME.OC	Mesic Organic Cryosol
HU.OC	Humic Organic Cryosol
TFI.OC	Terric Fibric Organic Cryosol
TME.OC	Terric Mesic Organic Cryosol
THU.OC	Terric Humic Organic Cryosol
GC.OC	Glacic Organic Cryosol
O.HG	Orthic Humic Gleysol
R.HG	Rego Humic Gleysol
FE.HG	Fera Humic Gleysol
SZ.HG	Solonetzic Humic Gleysol
O.G	Orthic Gleysol
R.G	Rego Gleysol
FE.G	Fera Gleysol
SZ.G	Solonetzic Gleysol
O.LG	Orthic Luvic Gleysol
HU.LG	Humic Luvic Gleysol
FE.LG	Fera Luvic Gleysol
FR.LG	Fragic Luvic Gleysol
SZ.LG	Solonetzic Luvic Gleysol
O.GBL	Orthic Gray Brown Luvisol
BR.GBL	Brunisolic Gray Brown Luvisol
PZ.GBL	Podzolic Gray Brown Luvisol
GL.GBL	Gleyed Gray Brown Luvisol
GLBR.GBL	Gleyed Brunisolic Gray Brown Luvisol
GLPZ.GBL	Gleyed Podzolic Gray Brown Luvisol
O.GL	Orthic Gray Luvisol
D.GL	Dark Gray Luvisol
BR.GL	Brunisolic Gray Luvisol
PZ.GL	Podzolic Gray Luvisol

SZ.GL	Solonetzic Gray Luvisol
FR.GL	Fragic Gray Luvisol
GL.GL	Gleyed Gray Luvisol
GLD.GL	Gleyed Dark Gray Luvisol
GLBR.GL	Gleyed Brunisolic Gray Luvisol
GLPZ.GL	Gleyed Podzolic Gray Luvisol
GLSZ.GL	Gleyed Solonetzic Gray Luvisol
GLFR.GL	Gleyed Fragic Gray Luvisol
TY.F	Typic Fibrisol
ME.F	Mesic Fibrisol
HU.F	Humic Fibrisol
LM.F	Limno Fibrisol
CU.F	Cumulo Fibrisol
T.F	Terric Fibrisol
TME.F	Terric Mesic Fibrisol
THU.F	Terric Humic Fibrisol
HY.F	Hydric Fibrisol
TY.M	Typic Mesisol
FI.M	Fibric Mesisol
HU.M	Humic Mesisol
LM.M	Limno Mesisol
CU.M	Cumulo Mesisol
T.M	Terric Mesisol
TFI.M	Terric Fibric Mesisol
THU.M	Terric Humic Mesisol
HY.M	Hydric Mesisol
TY.H	Typic Humisol
FI.H	Fibric Humisol
ME.H	Mesic Humisol
LM.H	Limno Humisol
CU.H	Cumulo Humisol
T.H	Terric Humisol
TFI.H	Terric Fibric Humisol
TME.H	Terric Mesic Humisol
HY.H	Hydric Humisol
HE.FO	Hemic Folisol
HI.FO	Histic Folisol
HU.FO	Humic Folisol
LI.FO	Lignic Folisol
O.HP	Orthic Humic Podzol
OT.HP	Ortstein Humic Podzol
P.HP	Placic Humic Podzol
DU.HP	Duric Humic Podzol
FR.HP	Fragic Humic Podzol
O.FHP	Orthic Ferro-Humic Podzol
OT.FHP	Ortstein Ferro-Humic Podzol
P.FHP	Placic Ferro-Humic Podzol
DU.FHP	Duric Ferro-Humic Podzol
FR.FHP	Fragic Ferro-Humic Podzol
LU.FHP	Luvisolic Ferro-Humic Podzol
SM.FHP	Sombric Ferro-Humic Podzol
GL.FHP	Gleyed Ferro-Humic Podzol
GLSM.FHP	Gleyed Sombric Ferro-Humic Podzol
GLOT.FHP	Gleyed Ortstein Ferro-Humic Podzol

O.HFP	Orthic Humo-Ferric Podzol
OT.HFP	Ortstein Humo-Ferric Podzol
P.HFP	Placic Humo-Ferric Podzol
DU.HFP	Duric Humo-Ferric Podzol
FR.HFP	Fragic Humo-Ferric Podzol
LU.HFP	Luvisolic Humo-Ferric Podzol
GL.HFP	Gleyed Humo-Ferric Podzol
GLSM.HFP	Gleyed Sombric Humo-Ferric Podzol
SM.HFP	Sombric Humo-Ferric Podzol
GLOT.HFP	Gleyed Ortstein Humo-Ferric Podzol
O.R	Orthic Regosol
CU.R	Cumulic Regosol
GL.R	Gleyed Regosol
GLCU.R	Gleyed Cumulic Regosol
O.HR	Orthic Humic Regosol
CU.HR	Cumulic Humic Regosol
GL.HR	Gleyed Humic Regosol
GLCU.HR	Gleyed Cumulic Humic Regosol
B.SZ	Brown Solonetz
DB.SZ	Dark Brown Solonetz
BL.SZ	Black Solonetz
A.SZ	Alkaline Solonetz
GLB.SZ	Gleyed Brown Solonetz
GLDB.SZ	Gleyed Dark Brown Solonetz
GLBL.SZ	Gleyed Black Solonetz
B.SS	Brown Solodized Solonetz
DB.SS	Dark Brown Solodized Solonetz
BL.SS	Black Solodized Solonetz
DG.SS	Dark Gray Solodized Solonetz
G.SS	Gray Solodized Solonetz
GLB.SS	Gleyed Brown Solodized Solonetz
GLDB.SS	Gleyed Dark Brown Solodized Solonetz
GLBL.SS	Gleyed Black Solodized Solonetz
GLDG.SS	Gleyed Dark Gray Solodized Solonetz
GLG.SS	Gleyed Gray Solodized Solonetz
B.SO	Brown Solod
DB.SO	Dark Brown Solod
BL.SO	Black Solod
DG.SO	Dark Gray Solod
G.SO	Gray Solod
GLB.SO	Gleyed Brown Solod
GLDB.SO	Gleyed Dark Brown Solod
GLBL.SO	Gleyed Black Solod
GLDG.SO	Gleyed Dark Gray Solod
GLG.SO	Gleyed Gray Solod

PROFILE	Header from Detail II File
---	---
DATE	YY.MM.DD Date of last revision
A-THICK	Thickness of A Horizon
	L20 less than 20
	G20 greater than 20
SOL-THICK	Soil thickness in centimeters
	99 Not applicable

SOL-CHEM	Soil Chemistry	
	UD	Undifferentiated
	EA	Extremely Acid
	AN	Medium Acid to Neutral
	WC	Weakly Calcareous
	VC	Very Calcareous
	EC	Extremely Calcareous
	SA	Saline
	-	Not applicable
PM-MODIFY	Parent Material Modification	
	SHAL	Shale
	CRET	Cretaceous
	TERT	Tertiary
	STON	Stony contact
	LIME	Limestone
	TECR	Tertiary-Cretaceous
	NA	Not applicable
PM-COMPLEX	Parent Material Complex	
	COM	Complex
	NA	Not applicable
PMDEP2	Parent Material Deposition for secondary soil	
	--	Not Applicable
	ANTH	Anthropogenic
	COLL	Colluvial
	EOLI	Eolian
	FLEO	Fluvioeolian
	FLLC	Fluviolacustrine
	FLUV	Fluvial
	FNPT	Fen Peat
	FOPT	Forest Peat
	GLFL	Glaciofluvial
	GLLC	Glaciolacustrine
	GLMA	Glaciomarine
	LACU	Lacustrine
	LATL	Lacustro-Till
	MARI	Marine
	RESD	Residual
	SAPR	Saprolite
	SEPT	Sedimentary Peat
	SPPT	Sphagnum Moss
	TILL	Till (Morainal)
	UNDM	Undifferentiated mineral
	UNDO	Undifferentiated organic
	VOLC	Volcanic
PM-CHEM	Parent Material Chemistry	
	UD	Undifferentiated
	EA	Extremely Acid
	AN	Medium Acid to Neutral
	WC	Weakly Calcareous
	VC	Very Calcareous
	EC	Extremely Calcareous
	SA	Saline
	-	Not applicable
PMTEXCLASS	Parent Material Textural Class	

	VCS	very coarse sand
	CS	coarse sand
	LCS	loamy coarse sand
	S	sand
	FS	fine sand
	LS	loamy sand
	LFS	loamy fine sand
	VFS	very fine sand
	LVFS	loamy very fine sand
	CSL	coarse sandy loam
	SL	sandy loam
	FSL	fine sandy loam
	VFSL	very fine sandy loam
	L	loam
	SIL	silt loam
	SCL	sandy clay loam
	SICL	silty clay loam
	CL	clay loam
	C	clay
	HC	heavy clay
	O	organic
	F	fibric
	M	mesic
	H	humic
	NA	not applicable
TEXMODIFY	Texture Modifier	
	GR	gravelly
	VG	very gravelly
	WY	woody
	NA	not applicable
FAMPARTS12	Family Particle Size	
	UD	undifferentiated
	FR	fragmental
	SK	skeletal
	SY	sandy
	CL	coarse loamy
	FL	fine loamy
	LY	loamy
	CY	clayey
	SM	stratified mineral
	SU	stratified mineral and organic
	SO	stratified organic
	OG	organic
	WY	woody
	FI	fibric
	ME	mesic
	HU	humic
	RU	bedrock undifferentiated
	RA	bedrock acid
	RB	bedrock basic
	RS	bedrock soft
	NA	not applicable
PHYSIOG	Physiography	
	PHY	physiographic

```
              NA    not applicable
```

The Soil Layer files contain the following information:

Column Name	Description
PROVINCE	Province abbreviation.
SOIL_CODE	The 3-character soil code, as in the Soil Name file.
MODIFIER	The 3-character modifier code, as in the Soil Name file.
LU	The land use code. See Soil Name file description above to decode.
LAYER_NO	The layer number for the soil.
HZN_LIT	Horizon lithological discontinuity. Decoding information for this is available from the CSSC (the meaning of this acronym is unknown, but it might mean something like "Canadian Soil Survey Code").
HZN_MAS	Master Horizon (upper case). Decoding information for this is available from the CSSC.
HZN_SUF	Horizon suffix (lower case). Decoding information for this is available from the CSSC.
HZN_MOD	Horizon modifier. Decoding information for this is available from the CSSC.
UDEPTH	Upper horizon depth (cm).
LDEPTH	Lower horizon depth (cm).
COFRAG	Coarse fragments (% by volume).
DOMSAND	Dominant sand fraction. - Not applicable VC Very Coarse C Coarse M Medium F Fine VF Very Fine
VFSAND	Very fine sand (% by weight).
TSAND	Total sand (% by weight).
TSILT	Total silt (% by weight).
TCLAY	Total clay (% by weight).
ORGCARB	Organic carbon (% by weight).
PHCA	pH in calcium chloride.
PH2	pH as specified in project report.
BASES	Base saturation (%).
CEC	Cation exchange capacity (meq/100 g).
KSAT	Saturated hydraulic conductivity (cm/hour).
KP0	Water retention at 0 kilopascals.
KP10	Water retention at 10 kilopascals.
KP33	Water retention at 33 kilopascals.
KP1500	Water retention at 1500 kilopascals.

Water retention units are % volume corrected for coarse fragment content.

BD	Bulk density (g/cm^3).
EC	Electrical conductivity (deciSiemens/meter).
CACO32	Calcium carbonate equivalent (%).
VONPOST	Von Post estimate of decomposition.
WOOD	Volume (%) of woody material.
DATE	Date of last revision.

8.2.2 Compressed CD-ROM Files

On the BOREAS CD-ROMs, the single tar file has been compressed with the Gzip compression program (file name *.gz). These data have been compressed using gzip version 1.2.4 and the high compression (-9) option (Copyright (C) 1992-1993 Jean-loup Gailly). Gzip (GNU zip) uses the Lempel-Ziv algorithm (Welch, 1994) used in the zip and PKZIP programs. The compressed files may be uncompressed using gzip (-d option) or gunzip. Gzip is available from many Web sites (for example, ftp site prep.ai.mit.edu/pub/gnu/gzip-*.*) for a variety of operating systems in both executable and source code form. Versions of the decompression software for various systems are included on the CD-ROMs.

9. Data Manipulations

9.1 Formulae

9.1.1 Derivation Techniques and Algorithms

Unknown.

9.2 Data Processing Sequence

9.2.1 Processing Steps

BOREAS Information System (BORIS) staff copied and compressed the file for release on CD-ROM.

9.2.2 Processing Changes

None.

9.3 Calculations

9.3.1 Special Corrections/Adjustments

Unknown.

9.3.2 Calculated Variables

Unknown.

9.4 Graphs and Plots

None.

10. Errors

10.1 Sources of Error

A potential source of error in the original data set could be digitizing error. There is also the possibility of coding errors in the attributes; the value of an attribute could have been keyed in incorrectly. There is some question about the positional accuracy of the data. Although the data are mapped at a scale of 1:125,000, the source of the mapping is aerial photography that was not orthocorrected. Therefore, the soils mapping may contain distortions that exist in the air photos. This problem can be mitigated by "rubber sheeting" the data to an accurate map base, or acquiring the original air photos and compensating for their distortions. However, the minor benefits of improved positional accuracy would probably not be worth the time and effort of correcting all of these data.

10.2 Quality Assessment

10.2.1 Data Validation by Source
Unknown.

10.2.2 Confidence Level/Accuracy Judgment
The source in Canada from whom these data were received has strong caveats about the use of the data. These data are constantly being updated as new data are collected and become available. These data represent broad generalizations about the soil characteristics of this area. Caution is to be used when inferring information from the data.

10.2.3 Measurement Error for Parameters
Unknown.

10.2.4 Additional Quality Assessments
Unknown.

10.2.5 Data Verification by Data Center
No quality assessment of these data was performed beyond displaying the data set to make sure that it appeared to be a digital soils map covering an area of Saskatchewan.

11. Notes

11.1 Limitations of the Data
Sharp discontinuities may exist along map boundaries. These differences could be a result of coding and mapping variations between adjacent maps.

11.2 Known Problems with the Data
The original vector data apparently were digitized from aerial photography that was not orthometrically corrected. Therefore, the locational accuracy of the soil polygons may not be as accurate as one might expect.

11.3 Usage Guidance
Users of these data should be cautious about inferring information from this data set and extending those inferences over a larger area. The polygons from the original data set are large and may have small inclusions of various soil types that are not mapped in these data layers.

Before uncompressing the Gzip file on CD-ROM, be sure that you have enough disk space to hold the uncompressed data files. Then use the appropriate decompression program provided on the CD-ROM for your specific system.

11.4 Other Relevant Information
Unknown.

12. Application of the Data Set

The original intended use of these data is unknown. Users from the BOREAS project might use these data for hydrological modeling or some other ecosystem modeling activity.

13. Future Modifications and Plans

None.

14. Software

14.1 Software Description

A GIS software package called ARC/INFO (Versions 6 and 7) was used to grid these data. ARC/INFO is a proprietary software package produced by Environmental Systems Research Institute, Inc. (ESRI). Gzip (GNU zip) uses the Lempel-Ziv algorithm (Welch, 1994) used in the zip and PKZIP commands.

14.2 Software Access

ARC/INFO is proprietary software with copyright protection. Contact ESRI for details:

Environmental Systems Research Institute, Inc. (ESRI)
380 New York St.
Redlands, CA 92373-8100

Gzip is available from many Web sites across the Internet (for example, ftp site prep.ai.mit.edu/pub/gnu/gzip-*.*) for a variety of operating systems in both executable and source code form. Versions of the decompression software for various systems are included on the CD-ROMs.

15. Data Access

The Agriculture Canada central Saskatchewan vector soils data are available from the Earth Observing System Data and Information System (EOSDIS) Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

15.1 Contact Information

For BOREAS data and documentation please contact:

ORNL DAAC User Services
Oak Ridge National Laboratory
P.O. Box 2008 MS-6407
Oak Ridge, TN 37831-6407
Phone: (423) 241-3952
Fax: (423) 574-4665
E-mail: ornldaac@ornl.gov or ornl@eos.nasa.gov

15.2 Data Center Identification

Earth Observing System Data and Information System (EOSDIS) Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC) for Biogeochemical Dynamics http://www-eosdis.ornl.gov/.

15.3 Procedures for Obtaining Data

Based on agreements made with Agriculture Canada, these data are available only to individuals and groups that have an official relationship with the BOREAS project. A raster version of this data set titled 'BOREAS Soils Data over the SSA in Raster Format and AEAC Projection' is publicly available and is included on the BOREAS CD-ROM set.

Users may obtain data directly through the ORNL DAAC online search and order system [http://www-eosdis.ornl.gov/] and the anonymous FTP site [ftp://www-eosdis.ornl.gov/data/] or by contacting User Services by electronic mail, telephone, fax, letter, or personal visit using the contact information in Section 15.1.

15.4 Data Center Status/Plans

The ORNL DAAC is the primary source for BOREAS field measurement, image, GIS, and hardcopy data products. The BOREAS CD-ROM and data referenced or listed in inventories on the CD-ROM are available from the ORNL DAAC.

16. Output Products and Availability

16.1 Tape Products

These data can be made available on 8-mm, Digital Archive Tape (DAT), or 9-track tapes at 1600 or 6250 Bytes Per Inch (BPI).

16.2 Film Products

None.

16.3 Other Products

These data are available on the BOREAS CD-ROM series.

17. References

17.1 Platform/Sensor/Instrument/Data Processing Documentation

Welch, T.A. 1984. A Technique for High Performance Data Compression. IEEE Computer, Vol. 17, No. 6, pp. 8-19.

17.2 Journal Articles and Study Reports

Acton, D.F., G.A. Padbury, and J.A. Shields. 1991. Soil Landscapes of Canada-Saskatchewan Digital Map Data; Scale 1:1000000; CanSIS No. SK018200, Version 90.11.30; CLBRR Archive, Agriculture Canada, Research Branch, Ottawa, Canada (CLBRR Contribution No. 91-107D).

Newcomer, J., D. Landis, S. Conrad, S. Curd, K. Huemmrich, D. Knapp, A. Morrell, J. Nickeson, A. Papagno, D. Rinker, R. Strub, T. Twine, F. Hall, and P. Sellers, eds. 2000. Collected Data of The Boreal Ecosystem-Atmosphere Study. NASA. CD-ROM.

Padbury, G.A and J.A. Shields. 1991. Soil Landscapes of Canada-Saskatchewan Soil Landscapes Polygon Attribute Digital Data. CanSIS No. SK018200, version 90.11.30; CLBRR Archive, Agriculture Canada, Research Branch, Ottawa, Canada (CLBRR Contribution No. 91-108D).

Sellers, P. and F. Hall. 1994. Boreal Ecosystem-Atmosphere Study: Experiment Plan. Version 1994-3.0, NASA BOREAS Report (EXPLAN 94).

Sellers, P. and F. Hall. 1996. Boreal Ecosystem-Atmosphere Study: Experiment Plan. Version 1996-2.0, NASA BOREAS Report (EXPLAN 96).

Sellers, P., F. Hall, and K.F. Huemmrich. 1996. Boreal Ecosystem-Atmosphere Study: 1994 Operations. NASA BOREAS Report (OPS DOC 94).

Sellers, P., F. Hall, and K.F. Huemmrich. 1997. Boreal Ecosystem-Atmosphere Study: 1996 Operations. NASA BOREAS Report (OPS DOC 96).

Sellers, P., F. Hall, H. Margolis, B. Kelly, D. Baldocchi, G. den Hartog, J. Cihlar, M.G. Ryan, B. Goodison, P. Crill, K.J. Ranson, D. Lettenmaier, and D.E. Wickland. 1995. The boreal ecosystem-atmosphere study (BOREAS): an overview and early results from the 1994 field year. Bulletin of the American Meteorological Society. 76(9):1549-1577.

Sellers, P.J., F.G. Hall, R.D. Kelly, A. Black, D. Baldocchi, J. Berry, M. Ryan, K.J. Ranson, P.M. Crill, D.P. Lettenmaier, H. Margolis, J. Cihlar, J. Newcomer, D. Fitzjarrald, P.G. Jarvis, S.T. Gower, D. Halliwell, D. Williams, B. Goodison, D.E. Wickland, and F.E. Guertin. 1997. BOREAS in 1997: Experiment Overview, Scientific Results and Future Directions. Journal of Geophysical Research 102 (D24): 28,731-28,770.

17.3 Archive/DBMS Usage Documentation

None.

18. Glossary of Terms

None.

19. List of Acronyms

```
ASCII   - American Standard Code for Information Interchange
BOREAS  - BOReal Ecosystem-Atmosphere Study
BORIS   - BOREAS Information System
BPI     - Bytes Per Inch
CanSIS  - Canadian Soil Information System
CD-ROM  - Compact Disk - Read-Only Memory
DAAC    - Distributed Active Archive Center
EOS     - Earth Observing System
EOSDIS  - EOS Data and Information System
ESRI    - Environmental Systems Research Institute, Inc.
GIS     - Geographic Information System
GSFC    - Goddard Space Flight Center
NAD27   - North American Datum of 1927
NAD83   - North American Datum of 1983
NASA    - National Aeronautics and Space Administration
NSA     - Northern Study Area
ORNL    - Oak Ridge National Laboratory
PANP    - Prince Albert National Park
SSA     - Southern Study Area
URL     - Uniform Resource Locator
UTM     - Universal Transverse Mercator
```

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BOREAS Staff Science, "BOREAS Staff Science GIS Data Collection Program." In Collected Data of The Boreal Ecosystem-Atmosphere Study. Eds. J. Newcomer, D. Landis, S. Conrad, S. Curd, K. Huemmrich, D. Knapp, A. Morrell, J. Nickeson, A. Papagno, D. Rinker, R. Strub, T. Twine, F. Hall, and P. Sellers. CD-ROM. NASA, 2000.

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13. ABSTRACT *(Maximum 200 words)*

This data set consists of GIS layers that describe the soils of the BOREAS SSA. These original data layers were submitted as vector data in ARC/INFO EXPORT format. These data also include the soil name and soil layer files, which provide additional information about the soils. There are three sets of attributes that include information on the primary, secondary, and tertiary soil type within each polygon. Thus, there is a total of nine main attributes in this data set.

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